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㉔ **Array antenna device having IC units with IF conversion circuits for coupling antenna elements and signal combiner.**

㉕ An array antenna device comprising an antenna array of a plurality of antenna elements (311...31n) for receiving an radio wave to produce receive signals and a signal combiner (32) for combining the receive signals to produce a combined signal. In order to reduce the combining loss and the transmission loss through the signal combiner, an amplifier and an IF conversion circuit comprising a mixer and a local oscillator are formed in an IC chip (541...54n). The antenna elements are contained in cases together with a plurality of IC chips, respectively, to form a plurality of units. The units are mounted on circuit board (51) with the signal combiner consisting of micro strip lines. In order to synchronize the local oscillators in the units with one another, a reference signal generator (41) is also formed on the circuit board and is coupled to the local oscillators. Variable phase shifters (561...56n) are used for adjust a direction of the main lobe of the antenna array and are also mounted on the circuit board. A similar structure is applicable to an array antenna device for radiating a transmission signal.

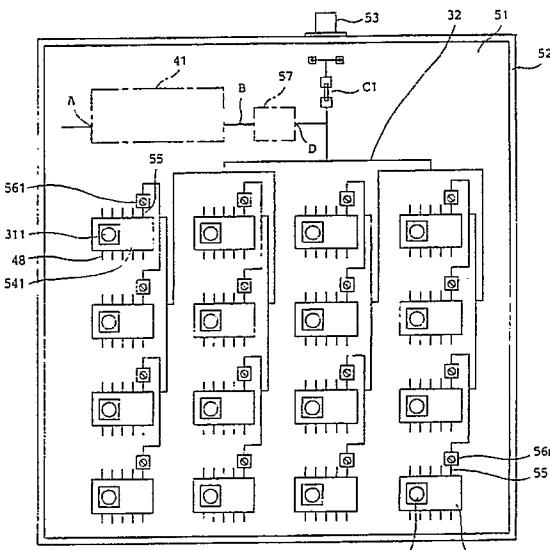


FIG.9

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DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	US-E- 32 369 (R.J. STOCKTON et al.) * figures 1-3; column 3, line 41 - column 5, line 4 * ---	1,2,26	H 01 Q 3/36 H 01 Q 21/00 H 01 Q 23/00
A	IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS vol. 18, no. 5, September 1982, pages 609-620, New York, US; B.D. STEINBERG et al.: "Phase Synchronizing a Nonrigid, Distributed, Transmit-Receive Radar Antenna Array" * page 612, figure 3, right-hand column, line 12 - page 613, left-hand column, line 20 * ---	1,2,26	
A	EP-A-0 006 650 (HOLLANDSE SIGNAALAPPARATEN) * figures 1,2; page 2, line 32 - page 5, line 20 * ---	1,26	
A	NACHRICHTENTECHNISCHE ZEITSCHRIFT NTZ vol. 30, no. 7, 1977, pages 586-589; J. ULBRIGHT et al.: "Stabilization of a Phase Shifting Injection Locked Oscillator Modul for Phased Array Application" * page 587, figure 1A; abstract * ---	1,26	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	PATENT ABSTRACTS OF JAPAN vol. 9, no. 24 (E-293)(1746), 30 January 1985; & JP - A - 59169205 (MITSUBISHI DENKI) 25.09.1984 ---	22 -/-	H 01 Q G 01 S
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
BERLIN	28-02-1991	BREUSING J	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			



DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 5)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	<p>FREQUENZ vol. 29, no. 2, 1975, pages 40-47; E. HOERMANN et al.: "Experimental results of an intermediate-frequency matrix-switched planar array antenna" * page 41, left-hand column, lines 2-14 *</p> <p>---</p> <p>EP-A-0 246 640 (BALL CORP.) * figure 2; page 5, line 4 - page 8, line 8 *</p> <p>-----</p>		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 5)
<p>The present search report has been drawn up for all claims</p>			
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BERLIN	28-02-1991	BREUSING J	
CATEGORY OF CITED DOCUMENTS		<p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>	
<p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p>			